

# Development of an ESD-protection device for high-frequency circuits

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When lightning strikes your IC...

Integrated circuits (ICs) can be found in almost all modern-day applications. Since they have to operate in every day life, they have to be protected against the hazards of an every day environment. One of the most prominent dangers is electrostatic discharge (ESD) which causes around 40% of electronic product failures. ESD-protection devices protect a circuit in the same way as a lightning rod protects a structure, this by conducting the discharge current around the circuit. During an ESD strike big amounts of current have to be conducted through an ESD-device. Because of this the internal resistance of the protection device must be low to limit the voltage rise on the affected input node. Especially for scaled-down technologies with low breakdown voltages this becomes very important.

For high-frequency circuits its also important to reduce the capacitive loading of the ESD-protection as much as possible. A simple way of doing this is using a string of diodes as protection and adding multiple diodes in series to limit the capacitance. Adding stages has the disadvantage that the clamping voltages linearly increases with the number of stages. To this extend a diode string was developed which realizes a less than linear increase of clamping voltage with the number of stages while the capacitance is effectively lowered.

A prototype chip was fabricated and tested. This showed very good agreement with simulations and demonstrated an adequate ESD-robustness level. Also leakage measurements where performed which identified the device as a promising candidate for low power applications.

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The author wishes to thank M. Scholz (IMEC) for performing the TLP, HBM and leakage measurements, R. Gillon (OnSemi) for additional leakage measurements and D. Linten (IMEC) for the useful remarks and assistance. The authors also wish to thank the COT Business Unit of the Wireline Infrastructure Division of STMicroelectronics for providing chip fabrication. This work is supported by the EU-funded FP7 ICT project C3-PO and by the Special Research Fund of Ghent University (starting grant 01N03011).